CLAIMS

What is claimed is:

1. A method comprising:

generating a granular entropy distribution using information obtained from a header of a compressed bitstream; and

applying one or more image processing operations based on the granular entropy distribution.

2. The method defined in Claim 1 further comprising decoding only a portion of coded data in the compressed bitstream as part of applying the one or more image processing operations.

3. The method defined in Claim 1 further comprising assigning a class label based on the header.

4. An article of manufacture having one or more recordable medium with executable instructions stored thereon which, when executed by a system, cause the system to:

generate a granular entropy distribution using information obtained from a header of a compressed bitstream; and

apply one or more image processing operations based on the granular entropy distribution.

5. The article of manufacture defined in Claim 4 further comprising instructions which, when executed, cause the system to decode only a portion of coded data in the compressed bitstream as part of applying the one or more image processing operations.

6. The article of manufacture defined in Claim 4 further comprising instructions which, when executed, cause the system to assign a class label based on the header.

7. An apparatus comprising:

means for generating a granular entropy distribution using information obtained from a header of a compressed bitstream; and

means for applying one or more image processing operations based on the granular entropy distribution.

8. The apparatus defined in Claim 7 further comprising decoding only a portion of coded data in the compressed bitstream as part of applying the one or more image processing operations.

9. The apparatus defined in Claim 7 further comprising assigning a class label based on the header.

10. A method comprising:

performing image analysis on a codestream based on header information in the codestream; and

decoding only coded data in one or more image portions specified by outputs of the image analysis.

11. The method defined in Claim 10 wherein performing image analysis comprises performing segmentation.

12. The method defined in Claim 11 wherein segmentation uses a Maximum A Posterari approach.

13. The method defined in Claim 10 wherein performing image analysis comprises performing classification.

14. The method defined in Claim 10 wherein performing image analysis includes extracting a granular entropy distribution.

15. An apparatus comprising:

means for performing image analysis on a codestream based on header information in the codestream; and

means for decoding only coded data in one or more image portions specified by outputs of the image analysis.

16. The apparatus of Claim 15 wherein the means for performing image analysis comprises means for performing segmentation.

17. The apparatus of Claim 16 wherein the means for performing segmentation uses a Maximum A Posterari approach.

18. The apparatus of Claim 15 wherein the means for performing image analysis comprises means for performing classification.

19. The apparatus of Claim 15 wherein the means for performing image analysis comprises means for extracting a granular entropy distribution.

20. An article of manufacture having one or more recordable medium with executable instructions stored thereon which, when executed by a system, cause the system to:

perform image analysis on a codestream based on header information in the codestream; and

decode only coded data in one or more image portions specified by outputs of the image analysis.

21. The article of manufacture of Claim 20 further comprising instructions which, when executed, cause the system to perform segmentation.

22. The article of manufacture of Claim 20 further comprising instructions which, when executed, cause the system to perform classification.

23. The article of manufacture of Claim 21 further comprising instructions which, when executed, cause the system to perform segmentation using a Maximum A Posterari approach.

24. An article of manufacture of Claim 20 further comprising instructions which, when executed, cause the system to extract a granular entropy distribution.

25. A method comprising:

extracting header information from codestream having encoded image data;

performing segmentation on the codestream based on the header information independent of decoding encoded image data;

decoding encoded image data necessary to represent a segmented image portion.

26. The method defined in Claim 25 further comprising extracting a granular entropy distribution.

27. The method defined in Claim 25 wherein performing segmentation occurs prior to decoding encoded image data.

28. The method defined in Claim 27 wherein the segmented image portion comprises a region of an image at a specific resolution.

29. An apparatus comprising:

means for extracting header information from codestream having encoded image data;

means for performing segmentation on the codestream based on the header information independent of decoding encoded image data;

means for decoding encoded image data necessary to represent a segmented image portion.

30. The apparatus of Claim 29 further comprising means for extracting a granular entropy distribution.

31. The apparatus of Claim 29 wherein the means for performing segmentation performs segmentation prior to decoding encoded image data.

32. The apparatus of Claim 31 wherein the segmented image portion comprises a region of an image at a specific resolution.

33. An article of manufacture having one or more recordable medium with executable instructions stored thereon which, when executed by a system, cause the system to:

extract header information from codestream having encoded image data;

perform segmentation on the codestream based on the header information independent of decoding encoded image data;

decode encoded image data necessary to represent a segmented image portion.

34. The article of manufacture of Claim 33 further comprising instructions which, when executed, cause the system to extract a granular entropy distribution.

35. The article of manufacture of Claim 33 further comprising instructions which, when executed, cause the system to perform segmentation prior to decoding encoded image data.

36. The article of manufacture of Claim 35 wherein the image portion comprises a region of an image at a specific resolution.

37. A method comprising:

receiving header information corresponding to a bit stream of multi-scale transform-based compressed data representing image data;

generating a feature vector corresponding to image description bits in the bit stream from the header information; and

performing one or more operations on at least a portion of the bit stream based on the feature vector.

38. The method defined in Claim 37 further comprising generating a distribution of the number of zero bit planes in one or more portions of compressed data, the distribution derived from the heading information.

39. The method defined in Claim 37 further comprising generating an entropy distribution based on the header information.

40. The method defined in Claim 39 wherein the entropy distribution is granular.

41. The method defined in Claim 39 wherein the entropy distribution comprises a map of bit distribution for the image data.

42. The method defined in Claim 39 wherein the entropy distribution is a length of coded data for codeblocks.

43. The method defined in Claim 37 wherein the header information is part of a JPEG 2000 file.

44. The method defined in Claim 37 wherein one of the one or more operations comprises classification.

45. An apparatus comprising:

means for receiving header information corresponding to a bit stream of multi-scale transform-based compressed data representing image data;

means for generating a feature vector corresponding to image description bits in the bit stream from the header information; and

means for performing one or more operations on at least a portion of the bit stream based on the feature vector.

46. The apparatus of Claim 45 further comprising means for generating a distribution of the number of zero bit planes in one or more portions of compressed data, the wherein distribution is derived from the header information.

47. The apparatus of Claim 45 further comprising means for generating an entropy distribution based on the header information.

48. The apparatus of Claim 47 wherein the entropy distribution is granular.

49. The apparatus of Claim 47 wherein the entropy distribution comprises a map of bit distribution for the image data.

50. The apparatus of Claim 47 wherein the entropy distribution is a length of coded data for codeblocks.

51. The apparatus of Claim 45 wherein the header information is part of a JPEG 2000 file.

52. The apparatus of Claim 45 wherein one of the one or more operations comprises classification.

53. An article of manufacture having one or more recordable medium with executable instructions stored thereon which, when executed by a system, cause the system to:

receive header information corresponding to a bit stream of multi-scale transform-based compressed data representing image data;

generate a feature vector corresponding to image description bits in the bit stream from the header information; and

perform one or more operations on at least a portion of the bit stream based on the feature vector.

54. A method for segmenting an image comprising:

receiving a header that contains multi-scale entropy distribution information on blocks of an image;

for each block, assigning to the block a scale from a set of scales that maximizes a cost function, wherein the cost function is a product of a total likelihood and a prior, wherein the total likelihood is a product of likelihoods calculated using the header of the block; and

segmenting the image by grouping together blocks that have been assigned equivalent scales.

55. The method of Claim 54, wherein the file represents an image in JPEG 2000 format.

56. The method of Claim 54, wherein each likelihood of a block is proportional to a summation, for each scale in the set of scales, of a product of a weight of the scale and a number of bits spent to code the block at the scale.

57. The method of Claim 56, wherein the number of bits spent to code the block at the scale is a numerator divided by a denominator, wherein the numerator is an entropy distribution of a multi-scale coefficient of the block at the scale, and wherein the denominator is four raised to the power of the scale.

58. A method for adaptively scaling an image comprising:

receiving a header that contains multi-scale entropy distribution information on blocks of an image;

for each block, determining that the block retains significance at a scale upon determining that an entropy of a multi-scale coefficient of a block at the scale is greater than a mean entropy of multi-scale coefficients of blocks in at least one coarser scale; and

scaling the image to a coarsest scale at which a threshold percentage of the blocks retain significance at the scale.

59. The method of Claim 58, wherein the file represents an image in JPEG 2000 format.

60. The method of Claim 58, wherein the mean entropy is a mean bit distribution multiplied by a threshold parameter.

61. The method of Claim 58 wherein the scale is selected based on following equation:

$$J_{opt} = \arg\min_{j}\left(\sum_{l=j}^{J}\sum_{i,k} B_1(i,k) \leq \left(B\sum_{l=1}^{J}\sum_{i,k} Bj(i,k)\right)\right).$$

62. A method for automatically scaling and cropping an image, comprising:

receiving a file that contains a header that contains multi-scale entropy distribution information on blocks of an image;

for each block and for each scale of a set of scales:

setting a cumulative entropy distribution for the block at a scale equal to a weighted summation of a number of bits spent to code the block for scales at and between a first scale and a maximum scale; and

for each width and height offset within a given image width and height, setting an indicator function of the block at the chosen scale and chosen width and height offsets to one upon determining that a width location of the block is not greater than a first minimum value and a height location of the block is not greater than a second minimum value, wherein the first minimum value is a minimum

value of a set consisting of a chosen width offset and a sum of the chosen width offset with the display width scaled by the first scale, and wherein the second minimum value is a minimum value of a set consisting of a chosen height offset and a sum of the chosen height offset with the display height scaled by the first scale;

computing a location and scale that together maximize a summation consisting of the cumulative entropy distribution for the block at the optimal scale multiplied with an indicator function of the block and by a parameter; and

cropping the image to the optimal location and down-sampling a resulting cropped image to the optimal scale.

63. The method defined in Claim 62 wherein the block is characterized by scale, width and height offsets.

64. The method of Claim 62, wherein the file represents an image in JPEG 2000 format.

65. A method comprising:

segmenting an image generating a rectangular multi-scale partition of the image based on a multi-scale probability distribution; and

generating a rectangular multi-scale partition of the image based on the multi-scale probability distribution.

66. The method in Claim 65 wherein generating the rectangular multi-scale partition of the image comprises fitting rectangles to the segmented image based on the multi-scale probability distribution, wherein filling rectangles to the segmented image includes finding a rectangle at each scale whose probabilities are similar to a probability at a higher scale such that content of the image in the rectangle is represented at a resolution associated with that scale.

67. The method defined in Claim 65 further comprising:

storing the rectangle; and

repeating the filling operation for at least one other rectangle.

68. The method defined in Claim 65 further comprising choosing the rectangle and scale with minimal difference in probabilities to the rectangle at a higher scale.

69. An apparatus comprising:

means for segmenting an image generating a rectangular multi-scale partition of the image based on a multi-scale probability distribution; and

means for generating a rectangular multi-scale partition of the image based on the multi-scale probability distribution.

70. The apparatus defined in Claim 69 wherein the means for generating the rectangular multi-scale partition of the image comprises means for fitting rectangles to the segmented image based on the multi-scale probability distribution, wherein the means

for filling rectangles to the segmented image includes means for finding a rectangle to each scale whose probabilities are similar to a probability at a higher scale such that content of the image in the rectangle is represented at a resolution associated with that scale.

71. The apparatus defined in Claim 69 further comprising:

means for storing the rectangle; and

means for repeating the filling operation for at least one other rectangle.

72. The apparatus defined in Claim 65 further comprising means for choosing the rectangle and scale with minimal difference in probabilities to the rectangle at a higher scale.

73. An article of manufacture having one or more recordable medium with executable instructions stored thereon which, when executed by a system, cause the system to:

generate a rectangular multi-scale partition of an image based on a multi-scale probability distribution; and

generate a rectangular multi-scale partition of the image based on the multi-scale probability distribution.

74. An article of manufacture having one or more recordable media with executable instructions stored thereon which, when executed by a machine, cause the machine to:

receive a header that contains multi-scale entropy distribution information on blocks of an image;

for each block, assign to the block a scale from a set of scales that maximizes a cost function, wherein the cost function is a product of a total likelihood and a prior, wherein the total likelihood is a product of likelihoods of the blocks; and

segment the image by grouping together blocks that have been assigned equivalent scales.

75. The article of manufacture of Claim 74, wherein the file represents an image in JPEG 2000 format.

76. The article of manufacture of Claim 74, wherein each likelihood of a block is proportional to a summation, for each scale in the set of scales, of a product of a weight of the scale and a number of bits spent to code the block at the scale.

77. The article of manufacture of Claim 76, wherein the number of bits spent to code the block at the scale is a numerator divided by a denominator, wherein the numerator is an entropy distribution of a multi-scale coefficient of the block at the scale, and wherein the denominator is four raised to the power of the scale.

78. An article of manufacture having one or more recordable media with executable instructions stored thereon which, when executed by a machine, cause the machine to:

receive a file that contains a header that contains multi-scale entropy distribution information on blocks of an image;

for each block, determine that the block retains significance at a scale upon determining that an entropy of a multi-scale coefficient of a block at the scale is greater than a mean entropy of multi-scale coefficients of blocks in at least one coarser scale; and

scale the image to a coarsest scale at which a threshold percentage of the blocks retain significance at the scale.

79. The article of manufacture of Claim 78, wherein the file represents an image in JPEG 2000 format.

80. The article of manufacture of Claim 78, wherein the mean entropy is a mean bit distribution multiplied by a threshold parameter.

81. An article of manufacture having one or more machine-readable media storing executable instruction thereon which, when executed by a machine, cause the machine to:

receive a header that contains multi-scale entropy distribution information on blocks of an image;

for each block and for each first scale of a set of scales:

set a cumulative entropy distribution for the block at the first scale equal to a summation of a number of bits spent to code the block for scales at and between the first scale and a maximum scale; and

set an indicator function of the block and the first scale to one upon determining that a width of the block is not greater than a first minimum value and a height of the block is not greater than a second minimum value and to zero otherwise, wherein the first minimum value is a minimum value of a set consisting of a width of the image and a sum of the width of the block plus one plus a desired height scaled by the first scale, and wherein the second minimum value is a minimum value of a set consisting of a height of the image and a sum of the height of the block plus one plus a desired width scaled by the first scale;

compute an optimal location and an optimal scale that together maximize a summation, for each block in the optimal location at the optimal scale, of the cumulative entropy distribution for the block at the optimal scale, multiplied by the indicator function of the block and the optimal scale, multiplied by a parameter; and

crop the image to the optimal location and down-sampling a resulting cropped image to the optimal scale.

82. The article of manufacture of Claim 81, wherein the file represents an image in JPEG 2000 format.

83. An apparatus comprising:

a receiving unit to receive a header that contains multi-scale entropy distribution information on blocks of an image; and

a processing unit coupled with the receiving unit, the processing unit to

for each block, assign to the block a scale from a set of scales that maximizes a cost function, wherein the cost function is a product of a total likelihood and a prior, wherein the total likelihood is a product of likelihoods of the blocks; and

group together blocks that have been assigned equivalent scales to segment the image.

84. The apparatus of Claim 83, wherein the file represents an image in JPEG 2000 format.

85. The apparatus of Claim 83, wherein each likelihood of a block is proportional to a summation, for each scale in the set of scales, of a product of a weight of the scale and a number of bits spent to code the block at the scale.

86. The apparatus of Claim 85, wherein the number of bits spent to code the block at the scale is a numerator divided by a denominator, wherein the numerator is an entropy distribution of a multi-scale coefficient of the block at the scale, and wherein the denominator is four raised to the power of the scale.

87. An apparatus to adaptively scale an image, comprising:

a receiving unit to receive a header that contains multi-scale entropy distribution information on blocks of an image; and

a processing unit coupled with the receiving unit, the processing unit to

for each block, determine that the block retains significance at a scale upon determining that an entropy of a multi-scale coefficient of a block at the scale is greater than a mean entropy of multi-scale coefficients of blocks in at least one coarser scale; and

scale the image to a coarsest scale at which a threshold percentage of the blocks retain significance at the scale.

88. The apparatus of Claim 87, wherein the file represents an image in JPEG 2000 format.

89. The apparatus of Claim 87, wherein the mean entropy is a mean bit distribution multiplied by a threshold parameter.

90. An apparatus to automatically scale and crop an image, comprising:

a receiving unit to receive a header that contains multi-scale entropy distribution information on blocks of an image; and

a processing unit coupled with the receiving unit, the processing unit to

for each block and for each first scale of a set of scales;

set a cumulative entropy distribution for the block at the first scale equal to a summation of a number of bits spent to code the block for scales at and between the first scale and a maximum scale; and

set an indicator function of the block and the first scale to one upon determining that a width of the block is not greater than a first minimum

value and a height of the block is not greater than a second minimum value and to zero otherwise, wherein the first minimum value is a minimum value of a set consisting of a width of the image and a sum of the width of the block plus one plus a desired height scaled by the first scale, and wherein the second minimum value is a minimum value of a set consisting of a height of the image and a sum of the height of the block plus one plus a desired width scaled by the first scale;

compute an optimal location and an optimal scale that together maximize a summation, for each block in the optimal location at the optimal scale, of the cumulative entropy distribution for the block at the optimal scale, multiplied by the indicator function of the block and the optimal scale, multiplied by a parameter; and

crop the image to the optimal location and down-sample a resulting cropped image to the optimal scale.

91. The apparatus of Claim 90, wherein the file represents an image in JPEG 2000 format.

92. A method comprising:

obtaining an estimation of a low bit rate entropy distribution from a high bit rate granular entropy distribution using information obtained from a header of a compressed bitstream; and

applying one or more image processing operations.

93. The method defined in Claim 92 wherein obtaining the estimation comprises extracting information from a first plurality of layers and ignoring packets in layers other than the first plurality of layers.

94. The method defined in Claim 92 further comprising determining an order in which bits are allocated.

95. The method defined in Claim 92 wherein the high bit rate distribution is a non-lossy distribution.

96. The method defined in Claim 92 wherein the high bit rate distribution is a lossless distribution.